

**CS Part 17. Electrical Installations
Compared With
29 C.F.R. 1926 Subpart K – Electrical**

- **1926.400 Introduction**
- **1926.403 General requirements**
- **1926.404 Wiring design and protection**
- **1926.405 Wiring methods, components, and equipment for general use**
- **1926.406 Specific purpose equipment and installations**
- **1926.407 Hazardous (classified) locations**
- **1926.408 Special systems**
- **1926.416 General requirements**
- **1926.417 Lockout and tagging of circuits**
- **1926.431 Maintenance of equipment**
- **1926.441 Batteries and battery charging**
- **1926.449 Definitions applicable to this subpart**

Summary: The significant differences between CS Part 17. Electrical Installations and 29 C.F.R. 1926.400 – 1926.449 are in:

- Employer responsibility
- Electrical installations, generally
- Wiring; attachment plug receptacles; extension and trailing cords; hand lamps; portable electric tools used in wet environment; convertor supplying equipment at more than 300 volts
- Exposure to energized conductors or switch gear of 440 volts between phases
- Switches, circuit breakers, dis-connectors, transformers, and boxes
- Grounding and bonding
- Temporary lighting
- Circuit protection
- Electrical equipment used in hazardous locations
- Inspection and repair of electrical equipment

The comparisons show only those provisions where MIOSHA rules are different than OSHA or where MIOSHA rules are not included in 29 C.F.R.

MIOSHA	OSHA
<p>R 408.41723. Employer responsibility. Rule 1723. (1) An employer shall assure that an employee does not engage in the installation activities to which this part applies unless the employee is a licensed electrician, or the employee is working with, or under the supervision of, a licensed electrician. A qualified employee is not required to be licensed when working on utility installation or maintenance such as, but not limited to, substations, switch yards, and street or highway lighting. (2) The employer shall insure that all live parts of electrical equipment operating at 50 volts or more are properly guarded against accidental contact.</p>	<p>1926.403(i)(2) Guarding of live parts. (i) Except as required or permitted elsewhere in this subpart, live parts of electric equipment operating at 50 volts or more shall be guarded against accidental contact by cabinets or other forms of enclosures, or by any or the following means: (A) By location in a room, vault, or similar enclosure that is accessible only to qualified persons. (B) By partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts. Any openings in such partitions or screens shall be so sized and located that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.</p>

MIOSHA	OSHA
<p>(3) The employer shall do all of the following:</p> <p>(a) Limit access to energized electrical equipment such as, but not limited to switch gear, transformers, and service panels, to qualified employees.</p> <p>(b) Provide, and insure the proper use of, an accident prevention sign on electric apparatus, equipment, and enclosures. The voltage shall be indicated.</p> <p>(c) Provide a conductor of an ampacity of not less than the rating of the circuit breaker or fuses protecting that circuit.</p> <p>(d) Insure that a bare conductor or earth return is not used for any temporary circuit.</p> <p>(e) Insure that all electrical wiring is protected from physical damage.</p>	<p>(C) By location on a balcony, gallery, or platform so elevated and arranged as to exclude unqualified persons.</p> <p>(D) By elevation of 8 feet (2.44 m) or more above the floor or other working surface and so installed as to exclude unqualified persons.</p> <p>1926.403(j)(2) Enclosure for electrical installations. Electrical installations in a vault, room, closet or in an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other equivalent means, are considered to be accessible to qualified persons only. A wall, screen, or fence less than 8 feet (2.44 m) in height is not considered adequate to prevent access unless it has other features that provide a degree of isolation equivalent to an 8-foot (2.44 m) fence. The entrances to all buildings, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked or shall be under the observation of a qualified person at all times.</p> <p>1926.405(a)(2)(ii) General requirements for temporary wiring (B) Branch circuits shall originate in a power outlet or panel board. Conductors shall be run as multi-conductor cord or cable assemblies or open conductors, or shall be run in raceways. All conductors shall be protected by overcurrent devices at their ampacity. Runs of open conductors shall be located where the conductors will not be subject to physical damage, and the conductors shall be fastened at intervals not exceeding 10 feet (3.05 m). No branch-circuits conductors shall be laid on the floor. Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor if the branch circuit is run as open conductors.</p>
<p>R 408.41724. Electrical installations, generally. Rule 1724. (1)****</p> <p>(4) Where an electrical pover circuit exists that can be contacted by an employee, the employer shall do both of the following:</p> <p>(a) Post and maintain accident preventions signs prescribed in Part 22, Signals, Signs, Tags, and Barricades, being R 408.42201 et seq. of the Michigan Administrative Code.</p> <p>(b) Advise the employee of the location of the lines, hazard involved, and protective measures taken or to be taken.</p> <p>(5) When an employee is using a jack hammer, bar, or other tool which could come in contact with an underground line, the energy source shall be de-energized.</p>	<p>No comparable OSHA provision.</p>

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<p>(6) A work space of not less than 3 feet wide and 6 1/2 feet high, in addition to space necessary to open equipment doors not less than 90 degrees, shall be provided and maintained in the area of electrical equipment.</p>	<p>1926.403(i)(1)(i) Table K-1-Working Clearances and 1926.403(j) Over 600 volts, nominal. (3) Workspace about equipment. Sufficient space shall be provided and maintained about electric equipment to permit ready and safe operating and maintenance of such equipment. Where energized parts are exposed, the minimum clear workspace shall not be less than 6 feet 6 inches (1.98 M0 high (measured vertically from the floor or platform), or less than 3 feet (914 mm) wide (measured parallel to the equipment). The depth shall be as required in Table K-2. The workspace shall be adequate to permit at least a 90-degree opening of doors or hinged panels.</p>
<p>R 408.41725. Wiring; attachment plug receptacles; extension and trailing cords; handlamps; portable electric tools used in wet environment; convertor supplying equipment at more than 300 volts.</p> <p>Rule 1725. (1) When electrical wiring is used in a tank or other confined space, a properly identified disconnect switch shall be provided at the entrance.</p> <p>(2) A receptacle for an attachment plug shall meet all of the following requirements:</p> <ul style="list-style-type: none"> (a) Be of the concealed contact type. (b) Have a contact for extending ground continuity. (c) Be designed and constructed so that the plug may be removed without leaving any live parts exposed to contact. (d) Not be capable of receiving attachment plugs for a voltage, frequency, or type of current different from that for which the receptacle is intended, nor shall a plug of a different style be forced into a receptacle. <p>(3) An extension cord used with a portable electric tool or appliance shall be a 3-wire type.</p> <p>(4) Extension cords and trailing cords shall be equipped with a plug cap which is either molded to the cord or equipped with a cord clamp to prevent strain on the terminal screws.</p> <p>(5) Conductors supplying temporary wiring shall be the minimum protective qualities of type NM wire for use indoors, or type UF wire for use outdoors.</p> <p>(6)****</p> <p>(7) Wiring for temporary lighting in excess of 12 volts used on barricades, fences, and sidewalk coverings shall be protected against abrasion or accidental damage to the insulation.</p> <p>(8) Trailing cords and extension cords shall:</p> <ul style="list-style-type: none"> (a) Be protected against damage. (b) Hung in a manner which does not damage the covering. (c) Retain their insulating value and dielectric and physical strength when spliced. (d) Be insulated to prevent shock or shorts. (e) Have a plug body or receptacle which is either molded to the cord or is equipped with a cord clamp to prevent strain on the terminal screws, or a receptacle installed in a steel box with a cover and cord clamp. <p>(9)****</p>	<p>1926.405(a)(2)(ii) General requirements for temporary wiring</p> <p>(C) Receptacles shall be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit shall contain a separate equipment grounding conductor, and all receptacles shall be electrically connected to the grounding conductor. Receptacles for uses other than temporary lighting shall not be installed on branch circuits which supply temporary lighting. Receptacles shall not be connected to the same ungrounded conductor of multi-wire circuits which supply temporary lighting.</p> <p>1926.405(j)(2) Receptacles, cord connectors, and attachment plugs (caps)</p> <p>(i) Configuration. Receptacles, cord connectors, and attachment plugs shall be constructed so that no receptacle or cord connector will accept an attachment plug with a different voltage or current rating than that for which the device is intended. However, a 20-ampere T-slot receptacle or cord connector may accept a 15-ampere attachment plug of the same voltage rating. Receptacles connected to circuits having different voltages, frequencies, or types of current (ac or dc) on the same premises shall be of such design that the attachment plugs used on these circuits are not interchangeable.</p> <p>1926.404 Wiring design and protection.</p> <p>(f)(7)(iv) Equipment connected by cord and plug. Under any of the conditions described in paragraphs (f)(7)(iv)(A) through (f)(7)(iv)(C) of this section, exposed noncurrent-carrying metal parts or cord-and plug-connected equipment which may become energized shall be grounded:</p> <p>(C)(1) Hand held motor-operated tools. 1926.405(g)(2)(iv) Strain relief. Flexible cords shall be connected to devices and fittings so that strain relief is provided which will prevent pull from being directly transmitted to joints or terminal screws.</p> <p>1926.405(a)(2)(ii)(I) Flexible cords and cables shall be protected from damage. Sharp corners and projections shall be avoided. Flexible cords and cables may pass through doorways or other pinch points, if protection is provided to avoid damage.</p>

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<p>(10) A portable light used in moist or other hazardous areas, such as a drum, tank, or vessel, shall be operated at a maximum of 12 volts, or shall be protected by an approved ground-fault interrupter.</p> <p>(11) A portable electric tool used in a wet atmosphere or environment shall be protected by an approved ground-fault interrupter.</p> <p>(12) An attachment plug or other connector supplying equipment at more than 300 volts shall be of the skirted type or shall be otherwise designed to confine any arcs.</p>	<p>1926.416 (e) Cords and cables. (2) Extension cords shall not be fastened with staples, hung from nails, or suspended by wire.</p> <p>1926.405(g)(2)(iii) Splices. Flexible cords shall be used only in continuous lengths without splice or tap. Hard service flexible cords No. 12 or larger may be repaired if spliced so that the splice retains the insulation, outer sheath properties, and usage characteristics of the cord being spliced.</p> <p>1926.405 (a)(2)(ii)(G) Portable electric lighting used in wet and/or other conductive locations, as for example, drums, tanks, and vessels, shall be operated at 12 volts or less. However, 120-volt lights may be used if protected by a ground-fault circuit interrupter.</p>
<p>R 408.41726. Exposure to energized conductors or switch gear of 440 volts between phases. Rule 1726. Where the work requires exposure to, or handling of, energized conductors or switch gear of 440 volts or more between phases, 2 or more qualified employees shall work together.</p>	<p>No comparable OSHA provision.</p>
<p>R 408.41727. Switches, circuit breakers, disconnectors, transformers, and boxes Rule 1727. (1) Each switch, circuit breaker, and disconnector shall meet all the following requirements:</p> <p>(a) Be marked to indicate its purpose unless it is so located that the purpose is evident and it is secured against displacement.</p> <p>(3) An arc shield shall be provided on a disconnect of 60 ampere capacity or larger.</p> <p>(4) A disconnecting means shall be provided to disconnect all energized conductors in a building or structure from the service entrance conductors.</p> <p>(5) An energized transformer and other related energized equipment over 150 volts to ground shall be protected to prevent accidental contact. The protection shall be an individual housing or an electrical substation fence. A metallic enclosure shall be grounded. Access to this equipment shall require a key or tool. A transformer mounted on a utility pole at a height of more than 12 feet is accepted from the requirements of this subrule.</p>	<p>1926.403 General requirements. (h) Identification of disconnecting means and circuits. Each disconnecting means required by this subpart for motors and appliances shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident. Each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident. These markings shall be of sufficient durability to withstand the environment involved.</p> <p>1926.403(f) Arcing parts. Parts of electric equipment which in ordinary operation produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.</p> <p>1926.404(e)(1)(v) Arcing or suddenly moving parts. Fuses and circuit breakers shall be so located or shielded that employees will not be burned or otherwise injured by their operation.</p> <p>1926.404(d) Services (1) Disconnecting means (i) General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The disconnecting means shall plainly indicate whether it is in the open or closed position and shall be installed at a readily accessible location nearest the point of entrance of the service-entrance conductors.</p>

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	<p>1926.404(f)(7) Supports, enclosures, and equipment to be grounded. (iii) Fixed equipment. (B) If located in a wet or damp location and subject to employee contact.</p>
<p>R 408.41728. Grounding and bonding. Rule 1728. (1) Except when an approved ground fault interrupter is provided, exposed noncurrent carrying conductive parts of portable and fixed electrical equipment including, but not limited to, motors, frames, and tracks of electrically operated cranes and electrically driven machinery shall be grounded. A grounding circuit shall be continuous, be capable of carrying the current imposed on it, and have a resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current. (2) Driven rod electrodes, either singly or connected, shall have a resistance to ground of not more than 25 ohms. (3) Conductors used for bonding shall be capable of carrying the imposed current. The bonding clamps shall have a secure and positive metal to metal contact. (4) When it is necessary to protect an employee from ground potential while he is working in proximity to energized primary equipment, such as is encountered in sub-stations and power plants, the employee shall be isolated or insulated from the hazard.</p>	<p>1926.404(f)(7)(iii) Fixed equipment. Exposed noncurrent-carrying metal parts of fixed equipment which may become energized shall be grounded under any of the following conditions: (A) If within 8 feet (2.44 m) vertically or 5 feet (1.52 m) horizontally of ground or grounded metal objects and subject to employee contact. (B) If located in a wet or damp location and subject to employee contact. (C) If in electrical contact with metal. (D) If in a hazardous (classified) location. (E) If supplied by a metal-clad, metal-sheathed, or grounded metal raceway wiring method. (F) If equipment operates with any terminal at over 150 volts to ground; however, the following need not be grounded: (1) Enclosures for switches or circuit breakers used for other than service equipment and accessible to qualified persons only; (2) Metal frames of electrically heated appliances which are permanently and effectively insulated from ground; (3) The cases of distribution apparatus such as transformers and capacitors mounted on wooden poles at a height exceeding 8 feet (2.44 m) above ground or grade level.</p> <p>1926.404(f)(7)(iv) Equipment connected by cord and plug. Under any of the conditions described in paragraphs (f)(7)(iv)(A) through (f)(7)(iv)(C) of this section, exposed noncurrent-carrying metal parts of cord- and plug-connected equipment which may become energized shall be grounded: If in a hazardous (classified) location (see 1926.407).</p> <p>1926.404(f)(7)(iv)(B) If operated at over 150 volts to ground, except for guarded motors and metal frames of electrically heated appliances if the appliance frames are permanently and effectively insulated from ground.</p> <p>1926.404(f)(7)(iv)(C) If the equipment is one of the types listed in paragraphs (f)(7)(iv)(C)(1) through (f)(7)(iv)(C)(5) of this section. However, even though the equipment may be one of these types, it need not be grounded if it is exempted by paragraph (f)(7)(iv)(C)(6).</p> <p>1926.404(f)(7)(iv)(C)(1) Hand held motor-operated tools; 1926.404(f)(7)(iv)(C)(2) Cord-and plug-connected equipment used in damp or wet locations or by employees standing on the ground or on metal floors or working inside of metal tanks or boilers; 1926.404(f)(7)(iv)(C)(3) Portable and mobile X-ray and associated equipment;</p>

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	<p>1926.404(f)(7)(iv)(C)(4) Tools likely to be used in wet and/or conductive locations;</p> <p>1926.404(f)(7)(iv)(C)(5) Portable hand lamps</p> <p>1926.404(f)(7)(iv)(C)(6) Tools likely to be used in wet and/or conductive locations need not be grounded if supplied through an isolating transformer with an ungrounded secondary of not over 50 volts. Listed or labeled portable tools and appliances protected by a system of double insulation, or its equivalent, need not be grounded. If such a system is employed, the equipment shall be distinctively marked to indicate that the tool or appliance utilizes a system of double insulation.</p> <p>1926.404(f)(8) Methods of grounding equipment(ii) Grounding conductor. A conductor used for grounding fixed or movable equipment shall have capacity to conduct safely any fault current which may be imposed on it.</p> <p>1926.404(f)(9) Bonding. If bonding conductors are used to assure electrical continuity, they shall have the capacity to conduct any fault current which may be imposed.</p> <p>1926.404(f)(10) Made electrodes. If made electrodes are used, they shall be free from nonconductive coatings, such as paint or enamel; and, if practicable, they shall be embedded below permanent moisture level. A single electrode consisting of a rod, pipe or plate which has a resistance to ground greater than 25 ohms shall be augmented by one additional electrode installed no closer than 6 feet(1.83 m) to the first electrode.</p>
<p>R 408.41729. Temporary lighting. Rule 1729. (1) A temporary light shall be equipped with a guard to prevent accidental contact with the bulb, except that a guard is not required when the bulb is fully recessed in the reflector.</p>	<p>1926.405(a)(2)(ii)(E) All lamps for general illumination shall be protected from accidental contact or breakage. Metal-case sockets shall be grounded.</p>
<p>R 408.41730. Circuit protection. Rule 1730. (1) Circuit protection shall be provided by fuses or circuit breakers for each feeder and branch circuit and shall be based on the current carrying capacity of the conductors and power load. (2) A fuse puller shall be used to install or remove a cartridge fuse when 1 or more terminals are energized. (3) A circuit protection device shall not be placed in a grounded circuit except where the device simultaneously opens both the ground and energized circuit. (4) Circuit protection in existing installations shall not be changed to increase the load in excess of the load rating of the conductor or equipment.</p>	<p>1926.405(a)(2)(ii)(B) Branch circuits shall originate in a power outlet or panelboard. Conductors shall be run as multiconductor cord or cable assemblies or open conductors, or shall be run in raceways. All conductors shall be protected by overcurrent devices at their ampacity. Runs of open conductors shall be located where the conductors will not be subject to physical damage, and the conductors shall be fastened at intervals not exceeding 10 feet (3.05 m). No branch-circuit conductors shall be laid on the floor. Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor if the branch circuit is run as open conductors.</p> <p>1926.416(d) Fuses. When fuses are installed or removed with one or both terminals energized, special tools insulated for the voltage shall be used.</p>

MIOSHA	OSHA
<p>R 408.41731. Location and protection of electric lines. Rule 1731. (1) Electric lines crossing work areas, employee foot or vehicular traffic aisles, shall be fastened overhead or protected by a cover capable of withstanding the imposed loads without creating a tripping hazard. (2) All wiring installed above grade and used for construction operations shall be maintained at a height which provided safe clearance for all work operations.</p>	<p>No comparable OSHA provision</p>
<p>R 408.41733. Battery room; safety equipment; charging battery. Rule 1733. (1) When a battery room is used in conjunction with construction operations it shall meet all of the following requirements: (a)^{****} (e) Have fire protection as required by Part 18. Fire Protection and Prevention, being R 408.41801 et seq. of the Michigan Administrative Code.</p>	<p>No comparable OSHA provision</p>
<p>R 408.41734. Inspection and repair of electrical equipment. Rule 1734. (1) Electrical equipment shall be inspected periodically. The inspection shall be made at reasonable intervals according to the equipment use and the severity of conditions under which it is used. Worn and frayed cable shall not be used. (2) Repairs of electrical equipment shall be made by a licensed electrician or an employee supervised by a licensed electrician except as provided in rule 1723 (1).</p>	<p>No comparable OSHA provisions</p>

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